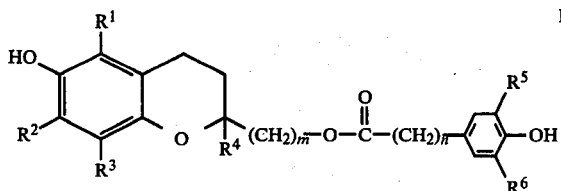


# CHROMAN-6-OL DERIVATIVES USEFUL FOR STABILIZING PLASTICS

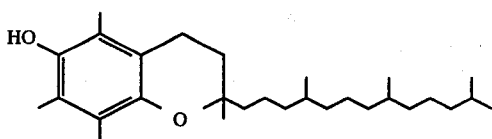
The present invention relates to novel chroman derivatives of the general formula I



where R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup> and R<sup>4</sup> are each H or C<sub>1</sub>-C<sub>4</sub>-alkyl, R<sup>5</sup> is sec.-C<sub>3</sub>-C<sub>8</sub>-alkyl or tert.-C<sub>4</sub>-C<sub>8</sub>-alkyl, R<sup>6</sup> is H or R<sup>5</sup>, m is 1, 2 or 3, and n is 0, 1, 2 or 3.

The invention further relates to the preparation of the compounds I, to their use as light stabilizers, heat stabilizers and oxidation stabilizers for plastics, and to the plastics stabilized with these compounds.

Chroman derivatives, especially  $\alpha$ -tocopherol (vitamin E)



are well known as stabilizers for plastics and organic materials (cf. German Pat. Nos. 1,114,319 and 1,136,102).

Although  $\alpha$ -tocopherol exhibits a good stabilizing action against the degradation of plastics during repeated processing by remelting, it is unsatisfactory in other respects.  $\alpha$ -Tocopherol frequently causes discoloration and gives only unsatisfactory stabilization results in the oven aging test, which permits an estimate of the useful life of the plastic. From a processing point of view also,  $\alpha$ -tocopherol, an oily substance prone to oxidation, presents problems. Furthermore,  $\alpha$ -tocopherol is relatively expensive and is therefore only in exceptional cases suitable as an additive to mass-produced materials, such as plastics.

Although simpler chroman derivatives, such as those described in German Laid-Open Application DOS No. 2,364,141, are cheaper, they are also less effective overall.

It is true in general that particular stabilizers possess only a few useful stabilizing properties, while being deficient in other respects. For example, the commercial phenolic stabilizers, eg. pentaerythrityl tetrakis-[3-(3,5-di-tert.-butyl-4-hydroxyphenyl)-propionate], provide good protection against the oxidative degradation of plastics, but not against degradation during processing and, in particular, repeated reprocessing.

For this reason, mixtures of various stabilizers have frequently been used, though this usually gives rise to technological difficulties.

It is an object of the present invention, as of the prior German Laid-Open Application DOS No. 3,010,505, to alleviate the above disadvantages and to provide industry with cheaper stabilizers having a broader spectrum of the desired stabilizing properties.

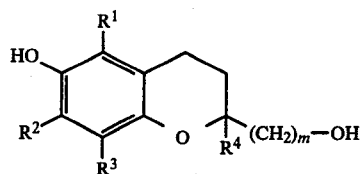
We have found that this object is achieved by the chroman derivatives I defined at the outset, which are exceptionally suitable for use as stabilizers for plastics.

Further, we have found various processes for the preparation of the chroman derivatives I, which are described in more detail below.

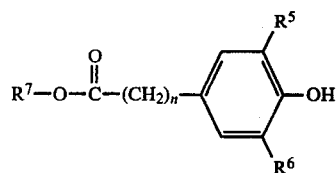
Amongst the compounds I, those where R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup> and R<sup>4</sup> are methyl are preferred, since chroman derivatives having this structure are particularly easy to prepare. Compounds I where R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup> and R<sup>4</sup> are each radicals other than methyl can be prepared in a similar manner, and their action as stabilizers is about the same as that of the tetramethylchroman derivatives.

An essential structure for achieving the stabilizing effect is the substituent R<sup>5</sup> in the ortho-position to the phenolic hydroxyl group. Although all secondary and tertiary alkyl groups according to the definition are basically suitable, compounds where R<sup>5</sup> is isopropyl or, especially, tert.-butyl are preferred for economic reasons. Furthermore, those compounds where R<sup>6</sup> is one of the radicals R<sup>5</sup> are preferred, since they possess a particularly powerful stabilizing effect in most cases. In contrast, the number of methyl groups m or n has no significant effect on the stabilizing action of the compounds I.

The chroman derivatives I are obtainable in a conventional manner by esterification of a chroman derivative II



with a phenol derivative of the general formula III



where R<sup>7</sup> is hydrogen or C<sub>1</sub>-C<sub>4</sub>-alkyl. The details of the numerous embodiments of the esterification (R<sup>7</sup>=H) and trans-esterification (R<sup>7</sup>=C<sub>1</sub>-C<sub>4</sub>-alkyl), in respect of the acidic or basic catalysts, the removal of the water of reaction or of the alcohols split off, the temperature and the reaction time, are well known, so that further explanation is unnecessary.

The purification of the compounds I, if necessary at all, can be carried out by recrystallization, for example from methanol/water.

The compounds II and their preparation have been disclosed in German Laid-Open Application DOS No. 3,010,504.

The majority of the phenol derivatives III are also known (cf. for example German Pat. No. 1,201,349) and can be prepared in general in a conventional manner, for example by the addition reaction of an acrylyl compound IV with a phenol V